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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,230	03/26/2004	Seshadri Ganguli	005975/P2	8995
44257	7590	10/16/2007		
PATTERSON & SHERIDAN, LLP 3040 POST OAK BOULEVARD, SUITE 1500 HOUSTON, TX 77056			EXAMINER STOUFFER, KELLY M	
			ART UNIT 1792	PAPER NUMBER
			MAIL DATE 10/16/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/811,230	GANGULI ET AL.	
	Examiner	Art Unit	
	Kelly Stouffer	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 January 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 and 19-55 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 and 19-55 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Due to the amendments and terminal disclaimer filed 24 January 2007, the objections to the drawing and specification and the rejections of the claims under double patenting have been withdrawn. The arguments are moot in view of the new grounds of rejection, presented below. The finality of this office action is hereby withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-17 and 19-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aaltonen et al. (US 2003/0165615) in view of Kawano et al. (US 6605735).

As to claim 1, Aaltonen et al. discloses a method of forming a ruthenium layer comprising a ruthenium layer deposited by pulsing a ruthenium precursor into a chamber and exposing it to the barrier layer and therefore chemisorbing it, and exposing the ruthenium layer to a reducing gas and reacting it to form the ruthenium layer, with purge gas pulses in between the pulses of reactant gases (paragraph 0021). Aaltonen et al. does not disclose the ruthenium precursors as required by claim 1. Kawano et al. teaches using the ruthenium compounds claimed as shown in column 3 line 39- column 4 line 12 in CVD because the compounds give the benefit of low temperature deposition and ease of supplying a precursor in gas form (column 3 lines 17-23) as the precursor cures the deficiencies of other precursors as discussed in columns 1 and 2 et seq. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Aaltonen et al. to include the precursors of Kawano et al. in order to use a precursor that gives the benefit of low temperature deposition and ease of supply. It also would have been obvious at the time of the invention to use CVD processes in an ALD process because "a person of ordinary skill

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has good reason to pursue the known options with his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.” Aaltonen et al. teaches that one of ordinary skill in the art would use ALD over CVD because of improved step coverage, uniformity, and thickness control (paragraph 0007). One of ordinary skill in the art would certainly find it within their technical grasp to use a CVD precursor in an ALD process with a reasonable expectation of success, given the advantages of using ALD in Aaltonen et al. and the precursors in Kawano et al. (See *KSR International Co. v. Teleflex Inc.*, 550 U.S.--, 82 USPQ2d 1385 (2007)).

Regarding claims 2-4, Kawano et al. teaches the claimed ligands in column 3 line 39- column 4 line 12.

Regarding claim 5, Aaltonen et al. discloses the reducing gas to comprise oxygen or nitrous oxide in paragraph 0056 and 0019.

Regarding claim 6, Aaltonen et al. discloses the ruthenium layer being formed at 300-360 °C (paragraph 0059).

Regarding claims 7 and 8, Aaltonen et al. discloses the ruthenium layer to be able to have a thickness of about 100 Å (paragraph 0071) and discloses the resistivity as less than 15 $\mu\text{ohms-cm}$ which given the corresponding thickness gives a sheet resistance of less than 2000 ohms/sq. when calculated in Tables 1-3. A lesser thickness, according to the conditions set forth in Tables 1-3, (for example less than 100 Å) would follow the trend and give an even smaller resistivity.

As to claim 9, Aaltonen et al. discloses depositing the ruthenium over a barrier layer including those claimed in paragraphs 0063, 0066-0067, for example.

As to claim 10, Aaltonen et al. discloses a low-k material of those claimed on the substrate in paragraphs 0063-0064, for example.

Aaltonen et al. in view of Kawano et al. includes all of the provisions of claim 11, as the ruthenium precursor taught by Kawano et al. includes bis(2,4-dimethylpentadienyl)ruthenium (column 3 line 39- column 4 line 12).

Aaltonen et al. in view of Kawano et al. disclose claims 12-17 and 19-54 as described above.

Regarding claim 55, Aaltonen et al. in view of Kawano et al. includes all the requirements of claim 55, and additionally Aaltonen et al. discloses the ruthenium layer as a seed layer for copper deposition and being deposited overtop a barrier layer in paragraph 0006.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

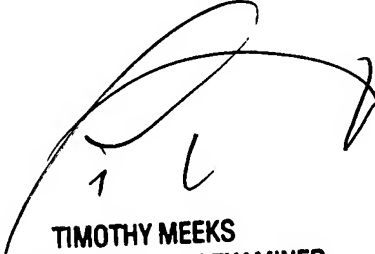
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1792

kms



TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER